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# FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION

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U.S. DEPARTMENT OF COMMERCE/National Bureau of Standards



## OPTICAL CHARACTER RECOGNITION (OCR)—DOT MATRIX CHARACTER SETS FOR OCR-MA

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CATEGORY: HARDWARE STANDARD

CATEGORY: CHARACTER RECOGNITION

FIPS PUB 129

**U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary***  
**NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director***

**Foreword**

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards, guidelines, and documents adopted and promulgated under the provisions of Public Law 89-306 (Brooks Act) and under Part 6 of Title 15, Code of Federal Regulations. These legislative and executive mandates have given the Secretary of Commerce important responsibilities for improving the utilization and management of computers and automatic data processing in the Federal Government. To carry out the Secretary's responsibilities, the NBS, through its Institute for Computer Sciences and Technology, provides leadership, technical guidance, and coordination of Government efforts in the development of standards, guidelines and documents in these areas.

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**Abstract**

This Federal Information Processing Standard announces the adoption of the American National Standard X3.111-1986, *Optical Character Recognition (OCR)—Matrix Character Sets for OCR-MA*, as a Federal Information Processing Standard. This standard provides the description, scope, and application rules for character sets that are generated by low resolution dot matrix printers and designed to match, as close as practical, the design of the OCR-A character set. A major purpose of this OCR standard is to reduce the cost of data input into ADP systems which use Optical Character Recognition (OCR) equipment.

**Key words:** character shapes; data entry; Federal Information Processing Standard; graphic shapes; matrix generated characters; OCR; optical character recognition.

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**Federal Information  
Processing Standards Publication 129**

**1987 May 6**



**Announcing the Standard for**

**OPTICAL CHARACTER RECOGNITION (OCR)—  
DOT MATRIX CHARACTER SETS FOR OCR-MA**

Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Bureau of Standards pursuant to section 111 (f) (2) of the Federal Property and Administrative Services Act of 1949, as amended, Public Law 89-306 (79 Stat. 1127), Executive Order 11717 (38 FR 12315, dated May 11, 1973), and Part 6 of Title 15 Code of Federal Regulations (CFR).

- 1. Name of Standard.** Optical Character Recognition (OCR)—Dot Matrix Character Sets for OCR-MA (FIPS PUB 129).
- 2. Category of Standard.** Hardware Standard, Character Recognition.
- 3. Explanation.** This Federal Information Processing Standard announces the adoption of the American National Standard, X3.111-1986, *Optical Character Recognition (OCR)—Matrix Character Sets for OCR-MA*, as a Federal Information Processing Standard. This standard provides the description, scope, and application rules for character sets that are generated by low resolution dot matrix printers and designed to match, as close as practical, the design of the OCR-A character set. A major purpose of this OCR standard is to reduce the cost of data input into ADP systems which use Optical Character Recognition (OCR) equipment.
- 4. Approving Authority.** Secretary of Commerce.
- 5. Maintenance Agency.** U.S. Department of Commerce, National Bureau of Standards (Institute for Computer Sciences and Technology).
- 6. Cross Index.** American National Standard Optical Character Recognition (OCR)—Matrix Character Sets for OCR-MA (ANSI X3.111-1986).
- 7. Related Documents.**
  - a. Federal Information Processing Standards Publication (FIPS PUB) 32-1, *Character Sets for Optical Character Recognition (OCR)* (adopts three ANSI standards: X3.2-1970(R1976), X3.17-1981, *American National Standard for Character Sets for Optical Character Recognition (OCR-A)* [applicable to this standard], X3.49-1975(1982)).
  - b. Federal Information Processing Standards Publication (FIPS PUB) 40, *Guideline for Optical Character Recognition Forms*.
  - c. Federal Information Processing Standards Publication (FIPS PUB) 85, *Optical Character Recognition (OCR) Inks* (adopts ANSI X3.86-1980, *American National Standard for Optical Character Recognition (OCR) Inks*).
  - d. Federal Information Processing Standards Publication (FIPS PUB) 90, *Guideline for Optical Character Recognition (OCR) Print Quality* (adopts ANSI X3.99-1983, *American National Standard for Information Systems—Optical Character Recognition (OCR)—Guidelines for OCR Print Quality*).
  - e. Federal Information Processing Standards Publication (FIPS PUB) 1-2, *Code for Information Interchange, Its Representations, Subsets, and Extensions* (adopts three ANSI standards X3.4-1977, *American National Standard for Code for Information Interchange (ASCII)* [applicable to this standard], X3.32-1973, X3.41-1974).



9. **Applicability.** This standard is applicable to Optical Character Recognition (OCR) systems utilizing any part or all of a character set contained herein when used in data entry systems. However, when data or information is being prepared using OCR techniques for the purposes of interchanging information, the appropriate graphic or control characters of FIPS PUB 1-2 *Code for Information Interchange, Its Representations, Subsets, and Extensions* shall be used for such interchange.

10. **Specifications.** This standard adopts in whole the American National Standard X3.111-1986, Optical Character Recognition (OCR)—Matrix Character Sets for OCR-MA.

11. **Qualifications.** The American National Standard Optical Character Recognition (OCR)—Matrix Character Sets for OCR-MA describes sets of characters and associated procedural rules for use with characters generated by dot matrix printers which match OCR-A characters as closely as practical. Additional standards and information sources are required to describe the full set of necessary characteristics of an installed, operating OCR system. In general, these cover the topics of OCR forms, OCR Print Quality, and OCR Tutorial Papers.

This standard shows variations in conformance to OCR-A shapes for different sets of characters, depending on the matrix resolution of the printed character. The character sets are defined by a specific combination of "dots" on a fixed grid. The character sets for OCR-MA1, OCR-MA2, and OCR-MA3 are defined. OCR-M1 can be met with  $5 \times 7$ ,  $7 \times 7$ ,  $7 \times 9$ , and  $9 \times 9$  matrices. OCR-M2 can be met with  $7 \times 7$ ,  $7 \times 9$ , and  $9 \times 9$  matrices. The OCR-MA3 characters can be obtained with the  $7 \times 9$  and  $9 \times 9$  matrices. In all cases, the  $9 \times 9$  matrix is the recommended matrix for the best recognition results. The  $7 \times 9$  matrix is the first alternative, the  $7 \times 7$  is the second, and the  $5 \times 7$  is the last recommended alternative to  $9 \times 9$ . The  $9 \times 9$  matrix characters, illustrated in Figures 7 through 58, of the referenced American National Standard and the  $7 \times 7$  matrix characters, illustrated in Figures 110 through 139, are designed to increase printer through-put by imposing the restriction that there are no dots on adjacent horizontal positions. Unlike OCR-A, where the emphasis is on reader performance, this standard has been written to reduce printing constraints to a level that will allow lower resolution printers to be usefully applied for OCR applications.

The American National Standard ANSI X3.111-1986 incorporates many of the characteristics defined in European Computers Manufacturers Association (ECMA) Standard ECMA-51, "Implementation of the Numeric OCR-A Font with  $9 \times 9$  Matrix Printers," Standard ECMA-42, "Alphanumeric Character Set for  $7 \times 9$  Matrix Printers," and Deutsches Institut für Normung (DIN) Standard 66 008, "Font A for Optical Character Recognition; Character Representation by Dots Within  $9 \times 9$  Matrix Dimensions."

Matrices with resolutions of dot densities greater than  $9 \times 9$  are not covered in this standard. However, higher resolution printers can create characters that meet the requirements of this standard. Often this can be accomplished by using a group of small dots closely spaced to create the same effect as one larger dot. High resolution matrix printers can also be used to create character sets that conform to FIPS 32-1.

12. **Implementation Schedule.** This standard is effective October 30, 1987. Immediate use by Federal agencies is strongly recommended when the use of dot matrix printers would contribute to operational benefits, efficiency or economy.

13. **Waivers.** Under certain exceptional circumstances, the head of the agency is authorized to waive the application of the provisions of this FIPS PUB. Exceptional circumstances which would warrant a waiver are:

- a. Significant, continuing cost or efficiency disadvantages will be encountered by the use of this standard and,
- b. The interchange of information between the system for which the waiver is sought and other systems is not anticipated.

Agency heads may act only upon written waiver requests containing the information detailed above. Agency heads may approve requests for waivers only by a written decision which explains the basis upon which the agency head made the required finding(s). A copy of each such decision, with procurement sensitive or

classified portions clearly identified, shall be sent to the Director, Institute for Computer Sciences and Technology, National Bureau of Standards, Gaithersburg, Maryland 20899.

When the determination on a waiver request applies to the procurement of equipment and/or services, a notice of the waiver determination must be published in the *Commerce Business Daily* as a part of the notice of solicitation for offers on an acquisition or, if the waiver determination is made after that notice is published, by amendment to such notice.

A copy of the waiver request, any supporting documents, the document approving the waiver request and any supporting and accompanying document(s), with such deletions as the agency is authorized and decides to make under 5 U.S.C. Sec. 552(b), shall be part of the procurement documentation and retained by the agency.

**14. Where to Obtain Copies.** Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (Sale of the included specifications document is by arrangement with the American National Standards Institute.) When ordering, refer to Federal Information Processing Standards Publication 129 (FIPSPUB129), and title. Payment may be made by check, money order, purchase order, credit card, or deposit account.



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